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CENTRAL INTELLIGENCE AGENCY

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REPORT

CD NO.

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COUNTRY	Yugoslavia	DATE OF INFORMATION	1945 - 1950
SUBJECT	Economic - Electrical industry		
HOW PUBLISHED	Handbook	DATE DIST.	26 Jun 1953
WHERE PUBLISHED	Belgrade	NO. OF PAGES	6
DATE PUBLISHED	Nov - Dec 1951	SUPPLEMENT TO REPORT NO.	
LANGUAGE	Serbian		

THIS IS UNEVALUATED INFORMATION

SOURCE Informativni prirucnik o Jugoslaviji, Book 1, Sections 20-21, 1951.

THE ELECTRICAL INDUSTRY IN YUGOSLAVIA

[The following report is based on an article in Informativni prirucnik o Jugoslaviji, a handbook which has been issued in sections since late 1948 by the Yugoslav Directorate for Information.]

Although the electrical industry is the youngest industrial branch in Yugoslavia, it has made significant progress in its development and in meeting Yugoslavia's demands for its products.

Prewar Electric Industry

An electrical industry, as a separate branch, did not exist in Yugoslavia before the war. There were a number of enterprises, branches of the metallurgical industry, which produced some electrical materials. They included large artisans' shops or shops of an artisan character, dependent on foreign firms for most of their semifinished products. The majority of these had developed from service shops, which maintained and repaired machines and installations delivered by foreign firms. Later, these shops began producing articles made from parts and semifinished products imported from parent organizations abroad. Foreign firms took advantage of the cheap manpower in Yugoslavia and protective import duties to establish factories with obsolete machinery discarded in well-developed industrial countries. This was the case with the cable and storage battery factories.

There were not very successful attempts to establish an electrical industry with domestic capital. However, the resulting enterprises depended on the purchase of semifinished products and parts from abroad, with the result that they merely assembled parts purchased from abroad or processed foreign raw materials at best. Attempts to establish a domestic electrical industry after World War I, including the "ITES" Electric Machine Factory (fabrika elektricnih masina "ITES") in Karlovac in 1921, the "Jugosijalica" Electric Light Bulb Factory (fabrika sijalica "Jugosijalica") in Zagreb in 1935, and the Transformer Factory (fabrika transformatora) in Ljubljana, failed because these industries yielded to the competition of large foreign firms. The foreign electrical industry dominated the Yugoslav market either through the direct import of finished products or through products from their

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shops in Yugoslavia. Before World War II, there were 20 electrical industry enterprises which employed a total of 1,185 people and produced electrical goods valued at 91,299,000 dinars. Two of these enterprises produced electric conductors, two produced electric machines, four produced storage and dry batteries, one repaired electric machines, eight produced varied electric materials, and three produced electric light bulbs. Three of these enterprises were in Serbia, nine in Croatia, and eight in Slovenia.

In addition, there was a radio industry, especially developed in Serbia, which assembled parts imported from foreign firms. The radio industry, consisting of four enterprises, employed about 400 people in Belgrade, Zemun, and Pancevo. This industry was destroyed at the start of World War II. An enterprise for the production of radio and telephone equipment for the army was located in Cacak and employed about 200 employees.

Electrical material valued at 180,700,000 dinars was imported from abroad in 1948, as compared with material valued at 176,100,000 dinars imported in 1938.

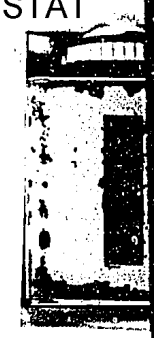
Most important electrical products, such as generators for power plants, transformers, distribution equipment, and measuring equipment, were imported from abroad.

The Electrical Industry in 1945

In 1945, the electrical industry was much the same as it had been before the war. Enterprises kept operating and war damage was quickly repaired. However, output was considerably lower than before the war. During the war, production of radio receivers had ceased completely and the majority of small enterprises owned by domestic capital had ceased operation, especially in Serbia. Enterprises in Zagreb and Novi Sad mostly maintained a normal rate of production during the war. Several artisans' enterprises producing electrical materials sprang up during the war, especially in Croatia, Slovenia, and the Vojvodina, but they were of no particular importance and could not have developed into large industrial enterprises. Among these were enterprises for producing dry cell batteries for flashlights, which ceased operation before the end of the war because of difficulties in procuring raw materials.

The more important electrical enterprises surviving the war were in Serbia, including the "Novkabel" Cable Factory (fabrika kabela "Novkabel") in Novi Sad, which produced conductors, insulated wire, and steel cable; the "Sever" Electric Machine Factory (fabrika elektricnih masina "Sever") in Subotica, which produced motors and generators for railroad car lighting; the "Grom" section of the Zrenjanin Machine Factory (fabrika masina u Zrenjaninu, which produced electric motors; and the "Tesla" Electric Light Bulb Factory (fabrika sijalica "Tesla") in Pancevo. There were several other small enterprises of local importance.

Most electrical industry enterprises in Croatia survived. These enterprises, located in Zagreb, included the "Rade Koncar" Electric Equipment Factory (fabrika elektricnih strojeva "Rade Koncar"), which produced mostly electric motors and some distribution equipment; the "Elka" Cable Factory (fabrika kabela "Elka"), which produced insulated and noninsulated cable, Bergman tubes, insulated wire, and steel cable; the "Kontakt" and "Elektroproizvod" factories, which produced electric installation equipment; the "Tez" Electric Light Bulb Factory (fabrika elektricnih sijalica "Tez"), and the "Dis" Domestic Light Bulb Factory (domaca industrija sijalica "Dis"); the "Munja" Storage Battery Factory (fabrika akumalatora "Munja"), and the "Kroacija" Factory, which produced dry batteries and flashlights. In



addition, there were a few small artisans' shops. Generally speaking, the enterprises in Zagreb were artisans' enterprises, equipped with obsolete machines and housed in buildings unfit for industrial production.

In Slovenia, surviving enterprises included the "Zmaj" Dry Battery Factory (fabrika suvih elemenata "Zmaj") in Ljubljana, and the "Impol" Enterprise in Slovenska Bistrica, which produced noninsulated electric cables, supplied rolled and drawn wire to the "Elka" Factory in Zagreb and the "Novkabel" Factory in Novi Sad, and produced copper and brass plate.

There were no electrical enterprises in the other republics.

Postwar Development of the Electrical Industry

Yugoslavia has raw materials for the development of the electrical industry, including copper, aluminum, and steel (which will be forthcoming with the development of the metallurgical industry). Various kinds of insulation material will be supplied by the chemical industry. There is sufficient raw material for dielectric porcelain. Plastic materials, such as polyvinyl chloride, bakelite, and others, will be produced by the Yugoslav chemical industry in satisfactory quantities. The textile industry already produces fabrics and cotton yarn needed for insulation.

Immediately after the liberation, an electrical industry department was established in the Power Section of the Federal Ministry of Industry, and electrical industry departments were established in the republic ministries in Serbia, Croatia, and Slovenia. These departments were the nuclei for the later administrative and operational managements of the electrical industry. The electrical industry departments were in operation until mid-1946, when main administrations were organized.

At the end of 1945, the first plans were worked out for the construction of the "Rade Koncar" Factory, the largest industrial enterprise in Zagreb. In 1946, the first credits were approved for the construction of electrical industry enterprises, primarily the "Rade Koncar" Factory. In 1945, the "Iskra" Precision Instrument Enterprise (preduzece precizne mehanike "Iskra") in Kranj was assigned to the electrical industry.

At the end of May 1946, the Main Administration for the Electrical Economy, with headquarters in Zagreb, was established in the federal Ministry of Industry. The Main Administration had an electrical industry section whose function was the administrative and operational management of electrical industry enterprises which had been declared federal enterprises. In October 1946, the Main Administration of the Federal Electrical Industry, with headquarters in Belgrade, was organized in the federal Ministry of Industry. In February 1947, the Main Administration of the Federal Electrical Industry became the Main Directorate of the Federal Electrical Industry which managed federal electrical enterprises. The Main Directorate of the Federal Electrical Industry was dissolved in July 1950, and its enterprises were incorporated in the newly established federal Directorate for Machine Construction, and the Directorates for Machine Construction of Serbia, Croatia, and Slovenia. The remaining electrical industry enterprises, which were turned over to the republics, were under the management of the republic Main Directorates for Electrical Industry of Croatia and Slovenia, and the Main Directorate for Metallurgy in Serbia. At present, electrical industry enterprises concerned with machine construction are under the management of the republic Main Directorates for Machine Construction, while electrical processing enterprises are under the management of the Main Directorates for Metallurgy.

During the first period of development of the electrical industry, it was impossible to construct completely new enterprises in areas where the industry was completely undeveloped. Consequently, the electrical industry was developed mostly around existing enterprises; development consisted primarily of modernizing production methods. At present, the electrical industry, with the exception of local industry, is still concentrated in Serbia, Croatia, and Slovenia.

Among electrical industry enterprises existing at the end of the war, 15 were relatively important, and provided the basis for further development. At the beginning of 1951 there were 27 electrical industry enterprises in operation, and four under construction.

The electrical industry started primarily with the production of key products, such as generators and electric motors, needed for electrification and industrialization called for by the Five-Year Plan. At present, Yugoslavia is producing all types of generators for hydroelectric power plants, while generators for thermal power plants are in preparatory stage. Power plants for which generators have been produced are the Mariborski Otok, Vuzenica, Mesici, Savica, Zrnovci, Vlasenica, Rijeka, Musovica, Pesocani, Ozalj, Sokolja, and other hydroelectric power plants. Hydrogenerators have been produced for the Slap Zete, Sapuncica, Zavrlje, Raska, Ovcar-Banja, Glava Zete, Medjuvrsje, Zvornik, Medvode, Jajce, Vrla, and other power plants.

In addition to generators, the "Rade Koncar" Factory has produced a great many electric motors.

Other plants producing electric motors include the "Sever" Factory in Subotica, the "Elektrokovina" Enterprise in Maribor, the "Motor" Enterprise in Skofja Loka, and the "Iskra" Enterprise in Kranj for its own use. At present, Yugoslavia produces enough electric motors to meet demand, except for some special types. The total capacity of electric motors produced in 1949 was 136,000 kilowatts.

The first electric transformers were produced in 1946. The "Rade Koncar" Factory has produced a number of 3-, 6-, 10-, and 35-kilovolt transformers. At present, 110-kilovolt transformers are in production. The "Elma" Electric Materials Factory (tovarna elektromaterijala "Elma") in Ljubljana produces transformers on a small scale.

In 1949, the total capacity of transformers produced was 167,000 kilowatt-amperes. In 1950, transformer production facilities were expanded considerably, so that future production is planned to be even greater because of serial production and because beginning difficulties have been overcome.

The production of high-torque and high-voltage switches, previously not produced in Yugoslavia, has been mastered by the "Rade Koncar" Factory. Prototypes have been produced and regular production is in preparation. The "Rade Koncar" has produced up to 35-kilovolt circuit breakers, and is working on circuit breakers up to 110 kilovolts.

Certain types of electric conductors were produced in Yugoslavia before the war, but not underground or underwater cable, or cable for industrial installations. The "Novkabel" Factory, the "Elka" Factory, and the "Impol" Enterprise, which produced electric conductors, were modernized after the war and their production increased.

In 1950, the production of noninsulated and insulated conductors totaled 4,926 tons. At present, Yugoslavia produces many types of conductors which were not produced previously, such as lead-covered installation cable and other types. The production of armatures has increased six times over 1946.

The Five-Year Plan calls for the construction of a new cable factory in Svetozarevo, which is now under construction.

Electric measuring instruments were not produced in Yugoslavia prior to 1948. They are now being produced by the "Iskra" Enterprise. At the end of 1950, electric meters, ammeters, and voltmeters were being produced serially, while the production of other electric measuring instruments was in a preparatory phase.

At present, the "Kontakt" Electrotechnical Factory (elektrotehnicka tvornica "Kontakt") and the T.E.P. Electrotechnical Factory (tvornica elektrotehnickih proizvoda) in Zagreb, the "Elip" Factory in Zemun, and the "Elma" Factory in Ljubljana are producing electric installation material. All these enterprises were built under the Five-Year Plan, but are not yet fully developed.

In Zagreb after the liberation the new "Tez" Electric Light Bulb Factory was constructed, which absorbed the old "Tez" and "Dis" electric light bulb factories. The "Tez" and "Tesla" factories produced a total of 4,428,000 bulbs in 1948, and 3,753,000 in 1950.

The production of storage batteries, which are produced by the "Munja" Factory, was 2.29 times greater in 1949 than in 1946, but somewhat lower in 1950.

The production of telephone instruments, which are produced by the "Iskra" Enterprise, was begun in 1947.

The production of electric power tools, which are produced by the "Iskra" Enterprise, is completely new in Yugoslavia. To date, electric hand drills are being produced serially, while the production of other tools is in a preparatory phase.

Motion picture projectors, which are produced by the "Iskra" Enterprise, have been produced in Yugoslavia since 1948. To date, motion picture projectors for standard film are being produced serially, while projectors for nonstandard-size film are being developed.

In 1946, the "Nikola Tesla" Enterprise was established in Belgrade to develop the production of radio equipment. This enterprise produced its first series of radio receivers in 1948. At first, production was based mostly on assembling imported parts, while only mechanical parts and radio cabinets were produced domestically. Today, a number of radio parts are being produced in Yugoslavia.

The "Radio Industrija" Factory in Zagreb produces amplifiers and microphone cabinets.

There are small artisans' enterprises producing radio equipment, such as signal equipment.

The RR-Zavodi in Nis, the most important radio enterprise, is under construction. It will start production in 1951. Its production program includes radio tubes, X-ray equipment and tubes, and radio equipment such as resistors, condensors, etc.

Since the war, the porcelain factory in Novi Sad has been modernized and expanded, and equipped for the production of dielectric porcelain. The factory produces dielectric porcelain for voltages up to 35,000 volts. Production of dielectric porcelain for voltages up to 100 kilovolts has been mastered. This factory uses domestic raw materials exclusively.

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A new factory for dielectric porcelain has been built in Stup near Sarajevo. This factory produces porcelain for voltages up to 100 kilovolts.

A new factory for dielectric porcelain is under construction in Arandjelovac. This factory is to produce dielectric porcelain for the electrical industry and for the electrical economy and communications. This factory will have a larger capacity than the above-mentioned factories. It will take over production of dielectric porcelain produced by industrial methods, while the other two factories will produce dielectric porcelain for high voltages using semi-industrial methods. The construction of the new factory and full utilization of existing factories will ensure sufficient supplies of dielectric porcelain needed for the development of the Yugoslav electrical industry, electrical economy, and communications.

The Yugoslav electrical industry is also developing production of industrial furnaces, electrical equipment for automobiles, electrical home appliances, etc.

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